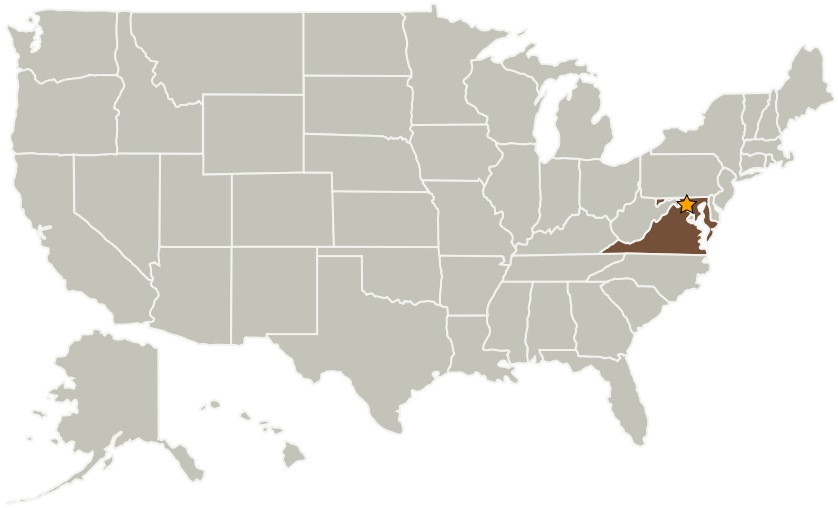
Vision-Based Attitude and Formation Determination System, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

To determine pointing and position vectors in both local and inertial coordinate frames, multi-spacecraft missions typically utilize separate attitude determination and formation metrology systems. For low Earth orbits (LEO), fleet position and geometry knowledge is almost exclusively achieved by using GPS data or ground uplink. In the ab-sence of this information, inter-satellite ranging between all member elements (e.g. RF, optically) is required in or-der to determine the system topology. While this represents a functional solution, the Earth Science (ES) Enterprise program has established a priority for the deployment and coordination of large fleets of space platforms. In re-sponse, AeroAstro proposes to develop an integrated vision-based GN&C system technology for attitude and forma-tion determination of multi-spacecraft missions. To achieve this capability, the design will incorporate a novel miniature star tracker (currently under development by AeroAstro), with a suite of innovative network algorithms. Requiring only a single node-node range measurement and communication of processed vision data from member platforms, fleet geometry determination will be insensitive to orbit altitude, topology, near-field interference, and proximity. In addition, AeroAstro will utilize its significant experience in developing microsatellite systems to de-liver a design that is optimized around simplicity, cost, and efficient use of available platform resources.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
AeroAstro Corporation	Supporting Organization	Industry	Ashburn, Virginia

Primary U.S. Work Locations	
Maryland	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ray Zenick

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.4 Attitude Estimation Technologies
    - TX17.4.3 Attitude Estimation Sensors